CITIZENS TECHNICAL ENVIRONMENTAL COMMITTEE

P.O. Box 593 | 27 West Park Street | Butte, Montana 59703-0593
406-723-6247 | www.buttectec.org | Buttectec@Hotmail.com

Montana Pole Soil Dioxin Treatment with White Rot Fungus Approximate Cost
September 7, 2018

Over the past year here has been a lot of discussion and public concern that the remedy at the Montana Pole Treating Plant Superfund site has not been effective for treating dioxin. The DEQ currently proposes that they will cap the dioxin contaminated soils and use institutional controls (zoning and land use restrictions) to protect the public and environment from dioxin. CTEC provided a question and answer summary (October 30, 2017) which looked at the issue of dioxin contamination and the public safety of DEQ's plan to cap dioxin at the site.

CTEC requested that we investigate an alternative treatment option which would potentially treat dioxin by using white rot fungus to degrade dioxin. As part of this investigation Cliff Bradley, who is a fungal treatment (mycoremediation) specialist, was asked to provide a report on the potential effectiveness of dioxin mycoremediation. Cliff's report and summary were provided to CTEC on August 28th. In summary, Cliff found that white rot fungus will likely reduce the concentrations of dioxin; however, evaluating how much the dioxin would be degraded and whether this could eliminate the need for a cap would require a pilot study using Montana Pole soil and testing various white rot fungus strains.

The second part of our investigation is provided here, which is an approximate cost estimate and timeframe for treating the dioxin contaminated soil using white rot fungus. Our engineer Peter Haun, PE worked with Cliff and me to determine the amount of soil and the treatment needs and prepare a project cost estimate. We estimate it would cost $10.5 million and require 8.5 years to treat dioxin in Montana Pole soil. This timeframe has a high degree of uncertainty until pilot tests are completed and does not include extra time which may be required for ROD amendment and public involvement. Assumptions used in this cost and timeframe estimate are detailed on the next page and in the engineer's cost estimate.

Our cost estimate does not evaluate the ability to pay for dioxin treatment using the existing settlement fund. The 1996 settlement agreement was a $35 million "cash out" Consent Decree with ARCO. Much of the $35 million has been spent on cleanup and groundwater treatment at the site over the last two decades. The money has also accrued significant interest. There also remains significant work to be done on groundwater treatment and reclamation of the site. Our cost estimation therefore does not include an evaluation of the ability to pay for mycoremediation using the remaining funds in the settlement account; this financial analysis would be under DEQ's purview.

Ian Magruder
CTEC Technical Advisor
KirK Engineering & Natural Resources, Inc.

Cost estimate assumptions:

- The existing land treatment unit (LTU) and land-farming equipment (tilling and irrigation equipment) will be used for mycoremediation.
- The 9 acre LTU can treat 21,780 cubic yards at a time (18" lift), 11 lifts will be required.
- Treatment will require 3 months per soil lift. Two lifts can be treated per year with a 6 month annual treatment season due to Butte climate. There is a high degree of uncertainty in the treatment time until the pilot tests are completed.
- Pilot tests (Site specific treatability and field study) will take 18 months, design/bidding/mobilization 18 months, treatment time for 11 lifts is 5.5 years: total project time is 8.5 years. This does not include any financial constraints on project implementation nor time for ROD amendments and public process if needed.
- Reclamation costs are additional; site reclamation is a cost which is already budgeted for the site.
- Only the 218,000 cubic yards of soil which was excavated and treated for pentachlorophenol (PCP) and petroleum contamination requires treatment for dioxin. This original treatment volume was based on the extent of PCP contamination. Dioxin contamination extent and volume may be different.
- Excavation and soil handling costs are from EPA, 2004 "Average Cost of Remedial Investigation Derived from Fund-Lead Superfund Costs" and were cross-checked with Parrott Tailings dig and haul costs from NRD's cost estimate Table 1A - Parrot Tailings Removal - Haul to MR Repository.
- Treatment will require 21,800 cubic yards of white rot fungus inoculated substrate.

Engineer's Cost Estimate

Task Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost	Notes/Assumptions
Excavation	165,000	CY	See Notes	$ 1,053,849	[1]Assumes excavation depth range of 5'-10': Total Cost = ($6.35 x CY)+$6,099. Volume assumes 165,000 CY of soil backfilled on site that requires excavation.
Soil Handling - Lifts	239,800	CY	See Notes	$ 1,908,808	[1] Total Cost = $7.96 x CY. Volume includes 53,000 CY that are already located within the LTU that will need to be moved into lifts for treatment, 17,000 CY stockpiled above ground, 165,000 CY of excavated soil, and 21,800 CY of white rot fungus innoculated substrate.
Backfill Treated Soil	228,900	CY	See Notes	$ 1,822,044	[1] Total Cost = $7.96 x CY. Assumes volume includes 218,000 CY of soil and 50% volume reduction of substrate during treatment.
Total Cost of Excavation and Backfilling (2004$)				$ 4,784,701	
Total Cost of Excavation and Backfilling (2018$)				**$ 7,185,376**	Based on historical RSMeans Construction Cost Indexes
White rot fungus inoculated substrate	21,800	CY	$ 100.00	$ 2,180,000	Assumes a 10% v/v application rate with $100 per CY of culture based on estimates provided by Clifford Bradley
Soil Tilling	148.64	acre	$ 100.00	$ 14,864	[2]Total area assumes soil lifts are 1.5' deep with 218,000 CY of soil and 21,800 CY of substrate.
Sampling	200	sample	$ 630.00	$ 126,000	[3,4]Assumes $100 for labor and transportation per sample. Cost of analysis is approximately $530 per sample.
Dust Control	450	acre	$1,936	$ 871,200	Assume dust control measures implemented during excavation, backfilling soil into lifts for treatment, soil tilling, and backfilling treated soil. Cost of application is $0.40/sqyd
Treatability and Feasibility Study				$ 150,000	[5] Quoted from referenced report.
			Total Cost	$ 10,527,440	

References

[1] USEPA 2004, *Interim Measures Cost Compendium* , Retrieved from https://www.epa.gov/enforcement/report-cost-documents-address-financial-assurance-may-be-required-rcra-facility

[2] Epplin, F.M., *Cost of Conventional Tillage and No-Till Continuous Wheat Production for Four Farm Sizes* , Retrieved from https://ageconsearch.umn.edu/bitstream/190714/2/231.pdf

[3] Casmalia Resources Board 2016, *Casmalia Resources Superfund Site: Final Feasibility Study* , Retrieved from https://www.waterboards.ca.gov/rwqcb3/water_issues/programs/stormwater/docs/lid/Casmalia_Superfund_Site/Final%20Feasibility%20Study/Main%20Text,%20Tables,%20Figures/All%20Text%20Sections.pdf

[4] Test America 2002, *General Services Administration Federal Acquisition Services (FAS) Authorized Federal Price List*

[5] Bradley, C., *Potential for funal Bioremediation of Butte Pole Yard Dioxin Contamination*